



Final Year Project Showcase for Batch-2016

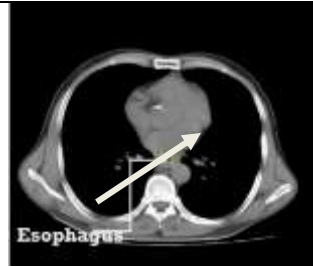
Department of Biomedical Engineering										
1	<b>Project Idea</b>	Robot Simulation For Tumor Identification Using Nanobot Swarms								
2	<b>Process</b>	Phase 1 - Research Phase 2 - Data point extraction Phase 3 - Insertion of biomarkers on the extracted data points for detection of tumor Phase 4 - Simulation of tumor on NetLogo Phase 5 - Navigation of nanobots & tumor identification.								
3	<b>Outcome</b>	Phase 1 - The research phase resulted in the selection of the appropriate softwares namely; NetLogo, Python Programming & ImageJ.  Phase 2 - ImageJ mask tumor and esophagus made using the Overlay option in the Image menu. Mask coordinates will be saved as a csv file.  Phase 3 - NetLogo code to read the .csv file of the tumor/biomarkers and detection of those biomarkers by nanobots.  Phase 4 - Tumor is simulated in NetLogo.  Phase 5 - Nanobots/agents were simulated and followed 3 key rules namely; alignment, cohesion and separation and detection of tumor was complete.								
4	<b>Evidences (Theoretical Basis)</b>	<table border="1"> <thead> <tr> <th>Number of cells</th> <th>Time taken to detect (seconds)</th> </tr> </thead> <tbody> <tr> <td>220</td> <td>27.29</td> </tr> <tr> <td>219</td> <td>30</td> </tr> <tr> <td>220</td> <td>31</td> </tr> </tbody> </table> <p><i>Number of cells detected per unit time</i></p> <p>Average number of cells = <math>(220 + 219 + 220)/3 = 219.67 \approx 220</math></p> <p>Average time take to detect the cells = <math>(27.29 + 30 + 31)/3 = 29.63 \approx 30</math> seconds</p> <p>Total number of cells = 224</p> <p>Efficiency = <math>\left(\frac{220}{224}\right) \times 100\% = 98.2\%</math></p>	Number of cells	Time taken to detect (seconds)	220	27.29	219	30	220	31
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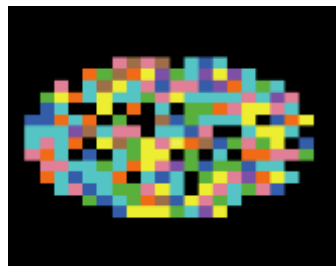
5	<p><b>Competitive Advantage or Unique Selling Proposition</b> (Cost Reduction, Process improvement, Attainment of any SDG (Sustainable Development Goal), increase of market share or capturing new market or having superior performance over competitor. In summary, any striking aspect of the project which compels industry to invest in FYP or purchase it. Some detail description is required in terms of how, why when what. You can select one or more from following dropdown and delete rest of them)</p> <p>Toshiba, Infinia, Siemens, Shimadzu, Mediso, Spectrum, are high-quality and highly recognized develop technologies but possess the major weakness of compromising the safety of healthy cells. Nanobot swarms have the capability of having a safe (no exposure of healthy cells to harmful radiations), precise and highly specific diagnostic tool.</p>	
a	<p><b>Cost reduction of existing Product</b></p>	<p>A limited number of nanobots can be made once and programmed multiple times. Hence after retaining them back from a patient's body we can use them again which greatly reduces our cost for cancer detection compared to conventional methods like CT simulator, PET-CT, X-RAY etc. which require huge setup and machines.</p>
b	<p><b>Process Improvement which leads to superior product or cost reduction, efficiency improvement of whole process</b> (e.g. What is issue is current process and what improvement you suggests)</p>	<p>Dynamics of the human body can be taken into account, which will enable us to target cancer cells in areas other than esophagus. While detecting cancer cells, nanobots can be made to destroy them as well. Hence, successfully treating cancer without destroying healthy cells.</p>
c	<p><b>Attainment of any SDG</b> (e.g. How it is achieved and why it is necessary for the region)</p>	<p>SDG 3, that implies good health and well-being of people is achieved as this detection method saves healthy cells while detecting cancer cells. We shall be attaining the SDG 9, that is industry, innovation and infrastructure by introducing a fairly new idea that gives rise to industrialization. SDG 12 is about responsible consumption and production which we shall be implementing by causing a reduction in the use of radioisotopes for cancer detection by consuming gold particles for producing nanobots. As cancer is one of the leading causes of death in the Pakistan reaching these sustainable development goals is of utmost importance.</p>
d	<p><b>Expanding of Market share</b> (e.g. how it expand and what is problem with current market)</p>	<p>Trends in the industry show that people rely on conventional methods for diagnosis of tumor eg: CT, PET, SPECT etc. Nanotechnology is new in the market around the globe hence hesitation to opt for a new technology due to initial market resistance to a new product. Thus, educating people about harmful aspects of conventional methods can greatly increase our market</p>



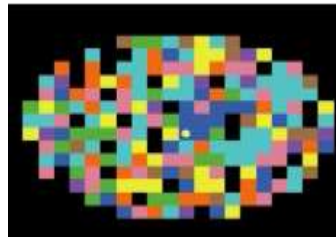
		<p>share among cancer patients. We can do that via telemarketing, advertisements, surveys and organizing seminars etc.</p> <p>The current market may need to import hardware machinery for the construction of nanobots and skilled labor which is unavailable.</p>
e	<b>Capture new market</b> (e.g. Niche market or unaddressed segment)	The niche market is hospitals treating cancer patients who have esophageal/GIT tract cancers. Unaddressed segment is Government Healthcare Policy Makers/Ministers.
f	<b>Any Environmental Aspect</b> (e.g. carbon reduction, energy efficient etc.)	<p>As using nanobot swarms for tumor diagnosis doesn't require any radioisotopes, there is an absence of hospital staff/patient's exposure to ionizing radiations, hence preventing the damage of healthy cells.</p> <p>They do not harm healthy cells because of their precision and capability of recognizing specific gene mutations (biomarkers).</p> <p>Minimal energy and power consumption.</p> <p>Doesn't require capacious rooms (is space-saving) to accommodate equipment/machinery as opposed to CT, SPECT, PET, X-RAY.</p> <p>Positive impact on patient's comfort and psychology by providing miniaturized diagnostic equipment with no requirements of any protective gear.</p>
g	<b>Any Other Aspect</b>	Raman spectroscopy optical imaging makes intracellular imaging possible, hence early diagnosis possible. Use of programmable nanobots, with user defined parameters, eliminates time constraints.
6	<b>Target Market</b> (Industries, Groups, Individuals, Families, Students, etc) Please provide some detail about user of the product, process or service	<p>Biomedical companies</p> <p>Hospitals i.e. oncology department</p> <p>National and international healthcare organizations</p>
7	<b>Team Members</b> (Names & Roll No.)	<p>Ummul Wara Saeed Khan BM-16008</p> <p>Hira Mehtab BM-16011</p> <p>Aisha Shahnawaz BM-16036</p> <p>Warda Imran Muallim BM-16038</p>
8	<b>Supervisor Name</b>	Engr. Tooba Arshad ( <a href="mailto:tooba97@live.com">tooba97@live.com</a> )
9	<b>Pictures</b>	<p>Phase 1 – (no pictures)</p> <p>Phase 2 – Coordinates extracted from DICOM image.</p>



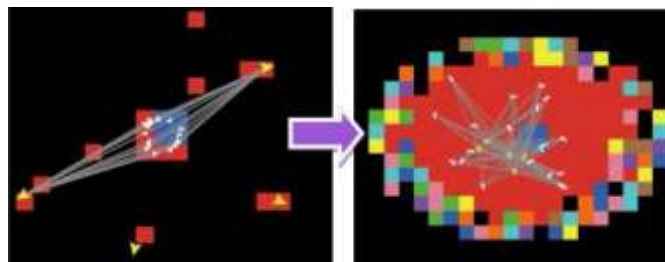
Phase 3 – Biomarkers incorporated onto coordinates.



Phase 4 – Raman endoscope with nanobots inserted into ROI (esophagus).




Phase 5 – Detection of biomarkers by nanobots while moving on the basis of principles.





# NED University of Engineering and Technology



		
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